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[OFFICIAL NOTICE.]

Eleventh Annual Meeting of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE, NEW YORK, Aug. 9, 1883.

The Eleventh Annual Meeting of the American Gas Light Association will be held in New York city on the 17th day of October, 1883, at 10 A. M., and continue for three days. The Committee of Arrangements have unanimously decided upon the Westminster Hotel, corner of Sixteenth street and Irving place, as the headquarters of the Association. The location is very central, being but one block east of Union Square, convenient to elevated railroad stations and principal surface car and omnibus routes. The appointments of the hotel are first-class in every respect, and the low rate of $3 per day has been secured—being quite a reduction from the regular rate charged. Members intending to be present at the meeting will please advise either Mr. James R. Floyd, 531 West 20th street, or Mr. Geo. Shepard Page, 49 Wall street, New York city, of the Committee of Arrangements, who will attend to the matter of engaging rooms, etc. It is important that early notice be given, in order that disappointments may be avoided. Gentlemen whose intention it is to be accompanied by their ladies will so advise.

Members are earnestly requested to prepare papers to be read, or to present, in other form, such facts as may be of general benefit which the experiences of management may have given them.

The Association owes to itself the duty of rendering its meetings of interest and practical value, not to its members alone, but also to that growing circle of those outside of its membership who, interested in the same industry, naturally look to this Association for instruction. It is therefore of the utmost importance that evidence of our active participation in, and knowledge of, the changing conditions of our business should mark the proceedings of the Association, if its influence upon the gas industry of the country is to be of permanent value. To this end all must share in the labor incident to the work, and feel an individual interest and responsibility.

The Secretary requests members to notify him, at as early a date as possible, of the topics they may select for papers. All requests and suggestions should be addressed to the Secretary, at 94 Dearborn street, Chicago, to receive prompt attention.

WM. HENRY WHITE, Secretary.

WHY THE SYSTEM OF ELECTRIC STREET LIGHTING IN NEW YORK CITY SHOULD NOT BE EXTENDED.

At a late meeting of the Board of Aldermen of this city it was proposed and recommended that the Gas Commission cause the whole of the river front streets to be lighted with the electric light. Should this be done, such proceeding would entail a largely increased outlay for the lighting, and this expense will, we think, be unattended with any corresponding benefit to the community.

Why an expensive arrangement of this sort should be entered into may be very perceptible to our "city fathers," but one not easily understood by ordinary minds. It may, however, have been recommended to assist in bolstering up the declining prospects of the electric lighting companies, which, at the present time, do not seem to stand any too well financially.

Be this as it may, the scheme certainly does not appear to be for the interests of the taxpayers of the city.

That a city's streets ought to be well and thoroughly lighted is a self-evident fact, appreciated by everyone; and it should be the duty of those having such lighting under their charge to see that the work is done both effectually and economically. We do not think—and this opinion is shared by many others—that the streets of this city now being lighted by electricity are very effectively illuminated; and we are also quite certain that the same streets could be much better lighted by gas, at an outlay corresponding to the sum now paid for electricity. The cost of one of the electric lights is at the rate of $255.50 per annum, while the cost of a gas lamp is but $17.50 for the same period; thus showing the cost of one electric light to be equal to the cost of 14½ gas lamps. The best result claimed by the advocates of electric lighting is that one arc lamp will displace but six gas lamps—even thus showing, by their own admissions, that the light obtained from one of the electric lamps is more than double the cost of that furnished by the use of gas.

Periodically, streaks of economy seem to steal gently over the feelings of the bodies who govern our cities, and it appears that the first spasm which generally afflicts them is to reduce, as low as possible, the quantity of gas used in the burners employed for street lighting purposes. By this process of reasoning, the gas sufficient for a street light is expected to be furnished from a burner consuming three cubic feet per hour. Burners of this size are not calculated to be very efficient for street lighting, and are evidently not at all economical. Small burners answer the purpose very well where but little light is required; but, for the thorough and efficient lighting of public streets, no burner consuming less than five or six cubic feet per hour ought to be used, if real economy in lighting is to be taken into consideration. With burners of these sizes our streets can be well and beautifully lighted, and at a cost of not even one-half the price paid for electricity.

As before mentioned in this article, the cost of an electric light is equal to the cost of 14½ of the gas lamps; this, of course, is with the use of the three-feet burners. By substituting for these those burning five or six feet, a beautiful light would be obtained, and the streets much better lighted than they are at present; and this could be done with a less number of lamps than now employed, and at a correspondingly less outlay. On the river front streets—which all will admit should be thoroughly lighted—burners of the larger sizes mentioned would be all that is needed; while at the ferry and railroad landings all concerned would be benefited if some of the Sugg, Siemens, or other high power burners were placed in position. Burners of this class give large volumes of light, and differ very materially from arc lamps in the thorough diffusion of the light afforded.

An examination and inspection of the large power burners now being introduced for the lighting of large areas, and which can be readily used for illuminating streets, would well repay those having such matters in charge, and, we are satisfied, convince them that gas is very far ahead of the electric light at the same price.

Burners of large powers, placed at the prominent street crossings in this city, would be very desirable to those having occasion to be out at late hours; and would, further, be a great protection to life and property in furnishing the light on the streets and sidewalks where light is needed, and not wasting it on the clouds.

THE DISPLAY OF GAS APPLIANCES AT THE TORONTO EXHIBITION.

The attention of our readers is called to the very complete account of what was done by the Consumers Gas Light Company of Toronto, Canada, at the industrial exhibition recently held in that city, and which will be found on pages 171-72 of this number of the JOURNAL. Mr. W. H. Pearson very kindly consented to act as our correspondent, and very thoroughly has he done his work.

In considering the fact that such good results have been accomplished through the medium of similar exhibitions in England and on the Continent of Europe, it is more than strange that gas proprietors on our side of the pond have been so slow to perceive the benefits reaped from such expositions by our transatlantic fraternity. The exhibit made by the Consumers Company, as will be seen from Mr. Pearson's account, has already borne its fruit in the impetus given to the business of his Company, and orders for gas stoves and gas engines are coming in in goodly numbers.

One of the most interesting features of the description is that portion which relates to the lighting of the Exhibition Company's building and grounds. The Consumers Company lighted, according to measurement by cubic feet of space, a little over one-sixth of the interior with gas, the remaining portion being illuminated by the electric light. The total consumption of gas per hour is stated to have been about 800 feet; and it is further said that the lighting would have been ample with a consumption of 650 feet per hour. The electric light folks had 10 Thomson & Houston, and 25 Arnoux-Hochhausen arc lights installed, and the 70,000 claimed candle power evolved by the same was not nearly as effective in lighting power in comparison as was the illumination in the section devoted to gas. The comparisons made by those visiting the fair all appeared to be in favor of the Siemens, Sugg, and Bray burners; and the citizens of Toronto are better satisfied now that if more light is needed in their streets, gas can be safely trusted to furnish it.

The exhibition made by the Consumers Company was an entire success from first to last, and shows what can be accomplished when gas men are put upon their metal. Mr. Pearson and his associates are to be congratulated upon their triumph; and we hope that their brethren in the United States will only follow the excellent example which has been set before them.

The Petroleum Outlook.

The general situation may safely be regarded as favoring the producer and the believer in higher prices for crude and refined petroleum. And yet, recent developments give the trade a somewhat paradoxical aspect. That is to say, while new production has been stimulated since September 1 by the opening of wells that rival the yield of the best developed in the Cherry Grove field, in 1883, yet unquestionable statistics go to prove that stocks of crude are being depleted at a rate, which has not been paralleled for at least six years. This decrease, during August was, in round numbers 200,000 barrels, while shipments during the same time increased 552,000 barrels.

At present writing (September 29) the continued success attending the opening of territory in the Balltown—Forest County—field, engrosses the attention of the trade. The speculative element finds stimulation in the wide fluctuations consequent upon the bringing in of new wells; and their subsequent rapid decline restores confidence and better prices. A second Cherry Grove can hardly be anticipated for at least two good reasons. The short life of the Balltown wells soon ends their power as producers. In the second place the best territory in this field is in the hands of a few operators whose policy is to develop slowly. In the Cherry Grove field small leases were granted to many operators and the rich deposit flung like an avalanche upon the producing trade. But the effect of these new wells will be to check the progress of "decreased production" for the time being. This element for August was 140,957 barrels as compared to July.

Refined has experienced an advance at all chief points. Late in August the New York market moved from 7¼ cents per gallon—for Abel's Test—to 8¼, then to 8⅜ where it now remains. Antwerp about September 15, advanced from 19¼ to 20¼ francs and still later London advanced from 6d. to 7d. per gallon, while European markets in general are reported steady and firm at the advance.

In regard to other and distant oil producing territory, it is as well to lay aside narrow-mindedness and admit the existence of such fields as need but time to become formidable competitors of northwestern Pennsylvania. Southern California in the New World and the Russian and Roumanian fields in the Old World are cases in point. Missourian and Mexican fields also assume more prominence yearly and in the event of a continued depletion in stocks and consequent enhancement of values, such enhancement must work to the advantage of these rival fields as well as of those at home.

The fluctuations during the month, in the price of crude have been of a purely speculative nature, quick advances of 5 to 10 cents per barrel being followed by reactions almost as rapid. The latter, however, did not reach the starting point, and each advance has left the market a trifle ahead of its former figure. The continuance of increased shipments, a large home and foreign consumption, the failure of new producing territory to augment pipe line runs materially, all contribute to a healthy state of the market and point to better prices in the near future. Though wild-catting progresses in all directions, no new territory has been discovered. The field already alluded to can scarcely be regarded as new, though future wells bored thereon may extend the area of the richer streak of oil rock it contains. This rock in its texture shows such qualities as will prevent it from ranking with the rock underlying the Bradford or the Allegheny fields.

Altogether, the situation is a satisfactory one to those who regard present prices ($1.15 per barrel) as beneath the value of crude. The opening of a new and dangerous field, is, in the light of recent developments, possible, but hardly more probable than was the case a month ago.—*Petroleum Reporter.*

A Busy Firm.

The Stacey Manufacturing Company, of Cincinnati, Ohio, reports a very brisk state of trade. This company is engaged in erecting gasholders at the following points: At Buffalo, N. Y., for the Mutual Gas Light Company; at Bloomington, Ill., for the Citizens Gas Light and Heating Company; at Troy, Ohio; Marshall, Missouri; Urbana, Ohio; also two large telescopic holders for the Cincinnati (Ohio) Company. J. H. Miller, Jr., who secured the franchise for building a gas works at Lemars, Iowa, has contracted with the Stacey Company for a 38′ by 16′ gasholder, as well as all of the ironwork necessary for the new establishment. This contract is to be completed by December 1st.

The Display Made by the Consumers Gas Company at the Toronto Industrial Exhibition.

By Mr. W. H. Pearson.

Some six months since I proposed to our president and directors that our company should make an exhibit similar in some respects to those which had been held in various parts of Great Britain, with the view of showing what gas could do as an illuminant, when properly burned, in competition with the electric light, as well as in cooking and heating, and as a motive power, and which the Toronto Industrial Exposition, held last month, presented a favorable opportunity for doing. The Board very readily and heartily entertained the proposal, and authorized any expenditure for the purpose that I might consider desirable, in the interest of the company, to make.

As most of your readers are aware, the exhibition has been held. The expenditure connected therewith has been considerable. The exhibition grounds and buildings not being supplied with gas, mains and service pipes had to be laid quite a distance. In addition, a good deal of fitting-up had to be done; and all of the articles, excepting one gas engine, were shown at the company's expense. It cannot, therefore, but be a source of gratification for me to know that everyone connected with the company is satisfied that the money expended has been well invested, and that I am able to say, without exaggeration, that, looking upon it from any point of view, the exhibition has proved a great success.

As requested by you, I shall endeavor to give you an account of the exhibition, but should have been much better pleased had someone else undertaken the duty. Before doing so, it may be as well to give you some items of interest regarding the general exhibition itself. That an annual exhibition has been held in Toronto for the past five years is owing to the enterprise and energy of a few of its citizens—notably Mr. John J. Withrow, to whom the chief credit must be given. It is under the control of a board of directors, who are all residents of Toronto; and, although a local institution, it is open to all the world. The grounds (now too small) comprise 65 acres, and are situated in the extreme southwestern portion of the city, about 3 miles from the business center and 4 miles from the gas works. They command a fine view of Lake Ontario, on the borders of which they are situated; and probably no better location for the purpose can be found anywhere. The grounds are well laid out with drives and walks, and are planted with trees, shrubs, and flowers. There is also an inclosed space for the exhibition of animals, races, etc. Most of the buildings are of a tasteful and ornamental character, and comprise the main building, and separate ones for machinery, agricultural implements, stoves, castings, dairy products, honey, horses, cattle, sheep, poultry, etc., a grand stand, agricultural, horticultural, and dining halls, etc.

Each annual exhibition has been in advance of the former ones, both as regards exhibits, attractions, and attendance. This year there were 1,939 exhibitors, and over 200,000 visitors during the ten days the exhibition was open, besides attendants.

To give a correct idea of what the gas company did in the way of lighting, some description of the main building, in which our exhibit was made, must be given. This building is 256 feet long, about 150 feet wide for about one-third of its length in the center, and 112 feet wide on either side; the height from end to end through the center being about 50 feet. There are two galleries running round the whole of the building, the north galleries being considerably wider than those on the south. The distance between the floors is 16 feet. In the center of the building is a fountain, above which (about 32 feet from the ground floor) is a platform connected by passages with the north and south upper galleries. We suspended from this platform a 1,000-candle power Siemens regenerator burner and lamp, which brilliantly lighted up the surrounding space for a distance round of about 70 feet, besides the aisles on two sides for a considerable distance. About one-fourth of the ground floor space under the northwestern portion of the front gallery was also lighted entirely by gas. Reckoning by cubic feet, a little more than one-sixth of the building was lighted by gas, and a little less than five-sixths by electricity. In addition to the Siemens lamps the following burners were used in lighting the gas company's space: Fifty-four 30-candle power flat-flame Bray burners, on double pendants, placed about 16 feet apart, and 44 smaller burners of various kinds, 36 of which were in brackets along one side of the wall, the light from which was obscured by globes for which they were used to exhibit.

The total consumption of gas per hour for all the burners, including the Siemens, was about 800 feet; and the total estimated candle power, with 17-candle gas, was about 2,600 candles. With this light every portion of the space was brilliantly illuminated, and it would have been amply and satisfactorily lighted with the Siemens and Bray burners alone, consuming less than 650 feet per hour. Some of the Bray 30-candle burners were subsequently replaced by some of Sugg's improved lamps, without there being any material difference in the amount of light given.

To light the other five-sixths of the building, 10 of Thomson & Houston Company's and 25 of the Arnoux & Hochhausen electric arc lights, of a claimed power of 2,000 candles each, were used; and yet this claimed total of 70,000 candle power failed to light the five-sixths of the space as effectively as 2,600 candle power of gas lights lighted the other one-sixth. It is very satisfactory to be able to state that generally the public admitted that the space lighted by gas was the better lighted, and that the gas light was the warmer and pleasanter one.

To obtain such a verdict is worth more than the expense of the exhibit. A better opportunity of judging as to the merits of the two lights could hardly have been afforded. Excepting the space lighted by the Siemens lamp, the other portion of the building lighted by gas was entirely distinct from that lighted by electricity; and yet, from several points, the effect of both lights could easily be seen at the same time. I think it no exaggeration to say that the Siemens lamp gave as much light as any two electric lights in the building. It is true that the spaces in the immediate vicinity of the electric light appeared to be the most brilliantly illuminated; but the light failed to radiate any distance, and there were numerous places about the portion of the building lighted by electricity where the shadows were so dark that the exhibits could not be distinctly seen, while in the space lighted by gas there were no dark shadows at all, and every object could be clearly seen in any part of it.

Another excellent opportunity was afforded of judging between the merits of the two lights by placing a 700-candle power Bray and an 800 to 2,000-candle Siemens lamp, each consuming about 130 feet per hour, in front of the main building, about 300 feet from which were several electric lights. The lanterns were placed on posts 14 feet high, about 100 feet apart, and about 40 feet from the main building, on either side of the principal entrance. Each of these lamps lighted a greater space around than any one of the electric lights on the grounds, and the same sized print could be read at a greater distance away.

Owing to an unfortunate delay, we were unable to exhibit an 800 candle Sugg street lamp ordered, which did not come to hand.

Our exhibit occupied a space 64 feet by 16 feet on the ground floor, in the northeastern end of the building, and attracted a very large share of attention, being generally surrounded by a crowd of interested spectators, most of whom had previously but little idea of the capabilities of gas. I might remark, in passing, that the exhibit was inspected by Her Royal Highness the Princess Louise, Prince George (son of the Prince of Wales), and the Marquis of Lorne. The Princess evinced considerable interest in the exhibit, and expressed herself as being much pleased with it. The exhibit was divided into five departments.

1. *Apparatus for the Measurement and Testing of Gas.*—Comprising a Sugg-Letheby photometer, a Sugg's illuminating power meter, a Lowe jet photometer, burner testers, registering and ordinary pressure gauges, dry meters (from 2 lights up to 150 lights), diaphragms, and all of the other separate parts of a dry meter, and a wet meter.

2. *Gas Engines.*—Including a 7-horse and a 2-hore Otto silent, the former of which was employed in working all of the machinery in the building, including sewing, envelope, and other machines; a 2 and 4-man "Bisschop;" a 2-man "Turner," and a 1 and 2-man "London." All of the engines save one were kept in operation, and one of the smaller ones was employed in grinding coffee, and another was attached to a Sturtevant blower.

3. *Gas Burners, Lamps, and Globes.*—These comprised burners of Sugg's, Siemens', Bray's, Peebles', and Rappleyee's make, as well as some old and poor ones; and a good and bad burner, each consuming the same quantity of gas, were placed on burner provers, so that the quantity used by each could be ascertained by anyone who might desire to do so. The contrast between the two lights was so marked that it could be seen at a glance. A printed card called attention to the fact that both burners were using an equal amount of gas. The lamps were Siemens', Bray's, and a number of Sugg's—such as the "Jay," "Lambeth," "Croydon," "Walthamstow," "Colchester Sunlight," and "Workshop." Modern globes, with large openings at the bottom, including a number of Sugg's beautifully hand-painted "Christianas," with his patent flat-flame governor burner, were shown; and beside them, by way of contrast, some old-fashioned frosted globes, with narrow openings at the bottoms, under which were hung cards calling attention to the flickering flames and obscured light, and warning the public against using them.

4. *Cooking, Boiling, and Heating Stoves.*—These stoves were of all sizes, from about a foot in diameter up to the large hotel stove, capable of cooking 100 pounds of meat at a time. A novelty in the cooking stove line that attracted much favorable attention was a combined coal and gas range. This was nothing more nor less than an ordinary coal range converted into a gas range in a very simple manner, by the introduction of pipes through the openings in the check-damper—usually covered with mica—in the upper part of the front of the stove, with circular burners attached under each of the openings in the top of the stove. To heat the oven, the burners were

introduced through two openings cut in one of the oven doors. Meat and bread were satisfactorily cooked and baked by gas in the oven. The cost of making the alteration did not amount to one-half the cost of an ordinary cooking stove; and as the burners and pipes can be easily removed whenever the weather or other circumstances may render it necessary to use coal, the invention—the credit of which is due to Mr. Laxton, one of the company's superintendents—will probably do much toward popularizing cooking by gas.

A large variety of boiling stoves, hot plates, etc., were shown, among which were a number with Fletcher's radial burners. The heating ovens were of Leonis', Goodwin's, and Baxendale's make.

A tag, on which was printed the cost of the article, the quantity of gas consumed per hour and the cost thereof, was attached to one of each kind of stoves and burners. Printed cards, setting forth the advantages of gas for various purposes, were placed in conspicuous places, and circulars to the same effect were freely distributed. Samples of various articles cooked or baked were exhibited in a showcase.

Perhaps the most interesting feature of the exhibits—at least to ladies—was the cooking department. This was in a prominent place in the stove department, immediately fronting one of the main avenues; and, special attention being called to it by several prominent signs in large letters, a very large number of persons visited it. Here a large hotel stove, and one of the company's make, were kept in constant use, cooking and baking; and the viands when cooked were placed where they could be inspected. We were fortunate in securing for this department the services of a lady who is not only a first-class cook, but also a first-class talker, and at the same time of prepossessing appearance; and if her efforts, both in the culinary and oratorical line, do not bear fruit in our receiving a large number of orders for gas cooking stoves next season, I shall feel very much disappointed. No better plan could, I think, have been taken to show how easily and comfortably excellent cooking could be done by gas; and many were the expressions of delight and surprise which fell from the lips of our fair friends as they witnessed the operation and saw the result. One of the good results accomplished was the disabusing their minds of the very common error that articles cooked in a gas stove smell and taste of the gas.

During the past two or three years I have, from time to time, issued circulars to every one of our gas consumers calling attention to the advantages of cooking by gas, and each quarter they receive a prominent notice on their gas bills to the same effect; but I am of opinion that this practical exhibition will do more toward the object sought than all of the circulars on the subject I have ever sent out. It was a great point to be able to have the cooking done where the people could see it without putting themselves about. They went to the exhibition "a sight-seeing," and that was one of the sights. Most people do not care to take the trouble to examine a new invention unless it is placed under their noses.

Among the exhibits shown were samples of coal, tar, oil, petroleum, ammoniacal liquor, and some aniline dyes.

It may not be out of place to state that the gas supplied was water gas, with a small admixture of coal gas during a few of the last days of the exhibition.

The 60-candle Sugg's "Whitehall" lamps, for street lighting, unfortunately arrived too late for most of the visitors to the exhibition to see them—not being in their places until the last day but one. They are up yet, and are very effective. With the reflectors, they have an effective lighting power of 100 candles, and they consume 22 cubic feet per hour. They are placed about 135 feet apart, the street being 66 feet wide; and every part of the section where they are located is admirably lighted.

I will, before concluding what I fear is already too lengthy a communication, mention another beneficial result of our exhibition. Last winter two of our principal skating rinks were lighted with electricity. The directors of one of them, not being satisfied with the system, visited the exhibition to examine the different lights. A few days since an application was made to me by the managing director to light up the rink with some of our improved burners and lamps for an entertainment held on the night of October 5th. The lamps were put up, and the lighting was a success. A number of the directors have expressed to me their satisfaction with the light; and there is every probability that gas will be used in the rink exclusively next winter.

Yet another result. We have had more applications for gas engines and heating stoves since the exhibition than we have ever had before in the same space of time.

I think it would not be right for me to close without saying that in carrying out this somewhat difficult and laborious undertaking, I have had the hearty co-operation of every employee of the company whose services were needed, and that the untiring and effective assistance of Mr. Laxton, already referred to, has been of special value.

The directors of the Exhibition Association have awarded our company one of the few gold medals given, as well as a diploma, for the exhibit.

History of William Murdock, Founder of the Gas Lighting Industry.

In our issue of August 16th it was stated that a proposition was being agitated in England, the object of which was to recognize in some suitable manner the services rendered to mankind by William Murdock, the pioneer in the field of gas lighting. Mr. Mathew Macfie, with whom originated this idea, evidently appears to be in earnest about the matter, and does not seem disposed to let the matter drop without having it thoroughly ventilated.

On Friday, September 14, Mr. Macfie delivered before the Balloon Society of Great Britain, at the Royal Aquarium, Westminster, a highly interesting lecture on "William Murdock, the Founder of the Gas Lighting Industry," a report of which is taken from the London *Journal*. Mr. Macfie, who was received with applause, with which his remarks were frequently interrupted, spoke as follows:

In collecting the materials for the following lecture, on the claims of Murdock to be commemorated as the first who introduced coal gas for the purposes of domestic and public illumination, I am in some measure able to supplement the details obtainable through the ordinary channels of information on the subject, by particulars which have reached me from survivors in different parts of the country—including some of Murdock's descendants, who were in constant communication with the man for a number of years before his death. Several persons are now alive who saw the first great exhibition of gas lighting, at Birmingham, 81 years ago. A grand-daughter of our hero—who is, perhaps, the best living authority as to the main facts of his ingenious, laborious, honorable, and useful life—writes me: "I had constant intercourse with him from my childhood to his death." I may add that I have paid repeated visits to the scenes of Murdock's inventive activity at Handsworth, as well as to the residence he built for himself in 1816, and from which he was conveyed to his last resting place, in the old church of that parish, 44 years ago, at the ripe age of 85 years. This general testimony, based on the personal intimacy of some of my informants with the subject of our sketch, carries us back directly to Murdock himself, and to his eminent contemporaries at the Soho Works.

The memory of Watt has been perpetuated by numerous and costly memorials, in his native town and elsewhere in Scotland, as well as at Birmingham. The outrage perpetrated on Priestly (the illustrious friend of Watt and the discoverer of oxygen) has been partly atoned for by a statue erected in the town where his house was burned down by an infatuated mob. But it is far from creditable to the scores of millions who have literally basked in the "light" of Murdock's genius throughout the whole civilized world, and who have in many instances derived large financial profit from his invention during the last 75 years, that—with the exception of a bust executed by Chantry, and provided by a few sympathizers—the idea of a fitting public monument to the inventor of gas has never once, as far as I am aware, been seriously entertained. This apparent neglect of the enormous services rendered by Murdock to mankind is referred to in the following terms by a popular writer on mineralogical subjects in a work published only last year: "We now know how universal has been the application of coal gas for lighting purposes since its first introduction; but where is the monument to William Murdock, to whose exertions the whole civilized world is indebted for this splendid system of artificial illumination?" The author adds: "England is not often so ungrateful to her benefactors as in the case of the originator of gas light." But this ingratitude is the more marked when it is remembered that the extent of Murdock's ingenious discoveries and inventions show him indisputably to have been endowed with powers at least equal, if not superior, to those of Watt and Stephenson; while his manliness and unselfishness, integrity and devotion to what he deemed a sense of duty, invest his character with a moral luster which, in this respect, lifts him incomparably above even the most distinguished of his industrial compeers.

William Murdock was born on the 21st of August, 1754, in the neighborhood of Auchinleck, in the county of Ayr; a parish of which Boswell, the biographer of Johnson, was an important landowner. The name I believe to be of Celtic origin; and it was probably spelt by his primeval ancestors, M'ardach—a word pointing back, like many other names of places and persons both in the Highlands and Lowlands of Scotland, to Sun and Phallic worship. The meaning is "the field of the upright one;" or the Druidical circle within which adoration was paid to the ancient Celtic deity.

The subject of our sketch, after coming to England, gradually fell into the habit of spelling his name with a "k" instead of an "h;" assigning as a reason that the English so murdered the Scotch guttural sound. But unquestionably the name was spelt by his own immediate family and ancestors with a final "h." The Murdochs are believed to have come in the Middle Ages from Belgium to Scotland, and to have taken a leading part in the construction of some of the Scotch cathedrals. William Murdock was the son of John Murdoch, a millwright and miller at Bellow, near old Cumnock; and from the latter William appears to have inherited his striking mechanical ingenuity. The father is known to have first designed iron-toothed cir-

cular gearing in Great Britain; and a pinion cast from his plans at Carron Works, near Falkirk, in 1745, is still in the possession of his great grandson at Gilwern, near Abergavenny. William had three brothers—Andrew, Mungo, and James; the first being older and the two last younger than himself. His sister Jean, born in 1748, was the eldest,* and his sister Euphemia was the youngest member but one of the family. As a rule, the Murdochs were a long-lived race; but the sons of William died before attaining the ripe age of their father. The eldest, called after him, died 8 years before him—in 1831; and John, the younger, died in 1862, at the age of 71, without having been married.

The man we propose to celebrate, having an irrepressible passion for the development of his latent engineering powers—for which his native village afforded insufficient scope—gravitated, like so many of his talented countrymen, toward the South. The fame of Watt, his illustrious compatriot, doubtless had some influence in attracting him to Birmingham. It was natural that a youth of 23, possessing his rare capacity to excel in the mechanical arts, should be fired with enthusiasm to settle where the new and far-famed steam engine was being manufactured, and under the direction of the inventor himself—then filling so large a space in the world's attention. Murdock called at the Soho Works in 1777, asking for employment. Watt was then from home; but when making known his wish to Boulton, he uncovered, and began twirling his hat in his hand. "What sort of hat is that you're wearing? What is it made of?" asked Boulton. It was neither of felt, nor cloth, nor silk; but seemed to be painted. "Timmer, sir, timmer," said Murdock. "Do you mean to say it is made of wood?" rejoined Boulton. "Indeed it is, sir," said Murdock. "How did you make it?" inquired Boulton. "I turned it mysel', sir," said Murdock, in the broadest Scotch, "in a bit lathey o' my 'ain makin'." Young as he was, he had invented oval turning by a lathe of his own manufacture; and this before he left the paternal roof. Boulton at once felt he was in the presence of genius as he looked into the open countenance of the tall, manly youth; and he told him he might call again. He was forthwith engaged, at 15s. a week when working at Soho; 17s. when working from home generally; and 20s. when sent up to London. Every month and year subsequently confirmed the favorable opinion that Boulton had formed of the raw Scotch lad. His superior ability, conscientiousness, and untiring dedication of himself to the duties imposed upon him, soon carried him over the heads of his fellow workmen, not excepting his seniors.

A rapid demand for Watt's engines was just then springing up at the Cornish mines; and before he had been two years in the service of the firm Murdock was told off to superintend the erection and direct the movements of these engines until their smooth working could be assured. He took his business so much to heart that, at one time, for nights together he did not allow himself any rest; and even when asleep the work under his charge quite mastered him. When he had the engine at Wheal Union ready for starting, the people in the house at which he lodged, at Redruth, were disturbed in their sleep, on one occasion, by sounds proceeding from his room at midnight. On entering, they found him hammering at his bedpost in his sleep, and saying, "Now she goes, lads! Now she goes!"

Murdock was the only workman from Soho who brought his firm any credit in Cornwall. When Boulton visited the mines in which the engines were being put up, he expressed astonishment at the enormous amount of labor his faithful servant was able to produce; and describes him as "flying from mine to mine and setting the engines right." When we consider how uniformly active, quicksighted, shrewd, and indefatigable he was as a workman, it will not seem surprising that Boulton should so often have exclaimed to Watt, "Would there were more Murdocks! He is the best engine erecter I ever saw." But it is hardly honorable to the firm that, until 44 years of age, his wages did not exceed £1 a week. He then asked for an advance to £2 2s. Boulton took occasion, along with some of the mining companies in Cornwall, to present him with 20 guineas, in token of their joint appreciation of his fidelity. But it was not for some considerable time afterward that his wages were raised. The worthy employee, however, in his characteristic self forgetfulness, remained as loyal as ever to his principals; and, in fact, allowed, in the course of many years, his earnings to the extent of thousands of pounds to remain untouched in their hands. To the lasting credit of the mining adventurers in Cornwall, who had such extensive experience of his capacity and energy, be it recorded that, when they heard of Murdock's intention to return to Birmingham, they offered him £1,000 a year to continue at the mine. Still his firm and honest nature could not be tempted by such inducements. Watt, on the other hand, who never allowed the splendor of his inventions to blind him to considerations of personal aggrandizement, more than once betrayed a petty jealousy of Murdock's popularity in the Duchy, quite unworthy of his fame.

On Murdock's return to Soho, in 1798, after an interval of nearly 20 years spent in erecting and adjusting mining engines in Cornwall, the two partners—animated, doubtless, quite as much by a regard for their own interests as by any adequate appreciation of Murdock's great talent and worth—decided to invest him with the general supervision and management of their mechanical department, at a salary of £1,000 a year; and his transfer to Birmingham promptly bore fruits in the various improvements and inventions he introduced. In the natural course of events, he ultimately became a partner in the firm he had so long and faithfully served.

Before alluding to the great discovery with which his name is mainly associated, it may be convenient to glance at some of the numerous other original productions of his fertile brain. To him belongs the distinction of first successfully applying steam to the propulsion of wheeled vehicles, at least in Great Britain. In 1784—about five years after he went to reside in Cornwall—he constructed, at Redruth, a model high-pressure steam engine, to run on wheels a foot high; the boiler being heated by a spirit lamp. A dark night was chosen for the trial of this novel machine. After the toils of the day were over, he started the engine on a lonely path leading up to the parish church, about half a mile from the town, between high hedges. He lit his lamp; and, before he was aware, the water boiled and off darted his engine with the inventor after it. Cries for assistance were soon heard by him from some frightened individual in the distance. It proved to be none other than the worthy clergyman of the parish, who confessed his fears that he had met the devil incarnate on the road, speeding his course on some diabolical mission. With this preliminary attempt at steam locomotion, Murdock's efforts unfortunately ceased. On hearing his success in this direction, Watt again showed some uneasiness; and, being in Cornwall at the time, wrote home to Boulton urging him to counsel Murdock to give up the project, and revealing pretty plainly his fear lest of the laurels he wished entirely to monopolize in the steam engine line Murdock might succeed in meriting a share. Boulton, however, who was decidedly more magnanimous, proposed to advance him £100 to prosecute his experiments. It was arranged that if, within a year, he was able to complete an engine capable of carrying two persons and the driver, with 200 pounds of luggage, fuel for four hours, and water for two hours, to run at the rate of four miles an hour, a partnership in the enterprise should be struck with the proprietors of the Soho Works. Though sanguine of success in this affair, Murdock was so handicapped with the daily responsibilities devolving upon him that he could not command sufficient time to perfect the invention. Had he enjoyed the opportunities accorded by Boulton to Watt, of following his bent without serious distraction, there is every reason to believe that the permanent achievements of Murdock would have been even more brilliant, enduring, and varied than they were. In preparing specifications of circular-motion machinery, Watt devised more than five distinct methods, by the introduction of wheels rotating round an axis; but he was eventually compelled to adopt on its merits, as much preferable to his own, the plan invented by Murdock, and shown in the model of the planetary motion prepared by the latter. "It has this singular property," said Watt, "of going twice round for each stroke of the engine; and may be made to go oftener round, if required, with additional machinery."

Another of Murdock's inventions, after he assumed the mechanical management at Soho, was the boring of cylinders by an endless screw working into a toothed wheel whose axis carried the cutter head, instead of by spear gear. In 1785 he invented the first oscillating engine, which for some time was exhibited at his house; the system still continuing in use. The model of this, with the tiny locomotive produced at Redruth, is in the hands of his great grandson at Gilwern. He improved upon Watt's double engine, by introducing the double D slide valve in place of the four poppet valves used by Watt; thus economizing steam, as well as ensuring simplicity. Another of his striking contrivances was a system of casting steam cases for cylinders in one piece, instead of in separate segments, bolted together, as previously. To him is due the merit of having invented a rotary engine of ingenious construction. Its efficiency was proved by the satisfactory manner in which he drove machinery by it in his own private workshop, although he never took pains to bring it into general use. The employment of compressed air as a motive power long engaged his attention, and he was able to work a little engine (of 12 inch cylinder and 18 inch stroke), which drove the engine in the pattern shop, on this principle. The compressed air of the blast engine was employed in blowing the cupolas at Soho; thus anticipating Perkin's apparatus.

The manner in which the idea struck him of the now celebrated cast iron cement, so largely used in engine and machine work, notably illustrates the keenness of his observing powers. Finding that some iron borings and sal-ammoniac had got casually mixed together in his tool chest and rusted his saw blade nearly through, he was led to mix these articles in various proportions, arriving at last at the composition of the cement, which afterward became an article of such extensive manufacture at the Soho Works that the cement invented by Watt was, in consequence, completely superseded. In 1810 he patented a method for cutting columns out of solid blocks by one

* These names and dates are kindly extracted for me from the Family Bible by Murdock's granddaughter, Mrs. Walton, of Tadmarton, near Banbury.

operation. In 1815 he added to the already large number of his inventions an apparatus for heating water, for the baths at Leamington, by the circulation of water through pipes in a boiler—a method since widely adopted for heating buildings and garden houses all over Europe, America, and the Colonies. Not the least ingenious product of this ever busy mind was a variety of machines which he contrived for the purpose of first grinding common peat-moss to the finest powder, and then consolidating it under immense pressure. This he had afterward moulded into beautiful armlets, medals, and necklaces capable of taking a most brilliant polish, and resembling very closely the finest jet.

In his later years the discovery struck him that fish skins might be used as an economical substitute for isinglass; and he came up to London to meet the leading brewers and explain to them the best method of preparing and using them. He engaged superior west-end lodgings during his stay; and so complete was his absorption in his immediate scientific task that he covered with fish skins, from ceiling to floor, the window-hangings in the handsomely furnished drawing room occupied by him. As might be expected from his misbehavior, there arose a serious fracas with his infuriated hostess, who ordered him out of the house at an inconveniently short notice. For some time afterward his attention was given to a plan for utilizing what he regarded as an enormous waste of power—viz., the tread of men and animals in the streets of the Metropolis; but there is no proof that his study of this matter was sufficiently deep to lead to any useful result. It was different, however, in the case of his experiments with an exhausted air-tube as a mode of transit. This idea, first elaborated by him, directly produced the atmospheric railway, the success of which, so far as it went, was in a great measure due to his pupil and successor, Samuel Clegg. Though the railway was abandoned, Murdock's original notion of the exhausted air-tube as a mode of transmitting letters and parcels, was permanently adopted and satisfactorily carried out by the well-known London Pneumatic Despatch Company.

But it is chiefly as associated with the universal introduction of coal gas as an illuminant that the memory of Murdock has a claim to be perpetuated in a more enduring manner than by ink and paper. We have but to transport ourselves in thought back to the dawn of the century, and contemplate the dismal oil lamps with which our fathers lighted their streets and dwellings, in order to appreciate the cheerfulness and comfort reflected by Murdock's invention upon family circles, public assemblies, and nocturnal pedestrians, in the interval since gas came into general use. Indeed, we are not without the means of forming some estimate of the advantages we enjoy, when, at the present time, from any accidental cause, our domestic supply of gas is cut off.

It is worth remembering, in this connection, that the very mineral out of which gas is manufactured was quite unknown to the ancients. Even in the form of fuel, it was not used in England until 1238.

Notice was first publicly drawn to carburetted hydrogen in this country by Thomas Shirley, who conducted some crude experiments, near Wigan, in 1659. By coincidence or design—it is not certain which—he found that the elastic fluid escaping from a well in that neighborhood could be easily ignited. A paper on the discovery was communicated by Shirley to the Royal Society, and printed in the "Philosophical Transactions" for June, 1667. The next reference to the matter occurs in 1733, when Sir J. Lowther reported some investigations he had made on the subject. In 1738 a letter was addressed by the very Rev. Dean Clayton, of Kildare, to the Hon. Robert Boyle, stating that prior to 1691 he had distilled coal in a retort, and stored up the gas in a bladder. Stephen Hales is said to have gone even further; and, in 1787, Lord Dundonald lit up Culross Abbey with gas made by his patent process for obtaining coal gas. Dr. Watson, Bishop of Llandaff, is also credited with an attempt to work out the problem. But none of these pioneers in the development of gas for practical lighting purposes treated it otherwise than as a scientific toy. It was not until Murdock—while employed at Redruth as engineer for Boulton and Watt, of Birmingham—in 1792, had applied his mind diligently to the distillation of gas, that the possibility of using it on a large scale, with profitable commercial results, was dreamed of. In that year he lighted his own cottage and offices at Cornwall with it; although his efforts were as yet only in their initial stage. He amused his leisure, after the regular engineering toils of the day, in analyzing earthy, vegetable, and other substances, while searching for illuminating gas. Here, too, he constructed a gas lantern with a jet attached to the bottom, and a bladder filled with gas underneath; and with this he lighted his way across the Cornish moors. His experiments upon coal and peat, which were laid aside for five years, were resumed in 1797.

A year or two previously Watt was urged by Murdock to take up the invention and patent it. But just then the firm at Soho was crippled by financial and legal difficulties. In 1798, however, on his return to Birmingham, Murdock followed out his investigations upon an enlarged scale, and with renewed vigor. He contrived an apparatus for making, purifying, and storing gas, with the view of supplying factories and towns. At the same time, remedies were devised by him to prevent gas giving forth an offensive odor. Soon after, the offices at Soho were lighted. The first public exhibition of the kind was made in March, 1802, on the occasion of the celebration of the Peace of Amiens, when the front of the Soho Works was brilliantly illuminated. Matthews, who was present, thus writes, in his own grandiloquent way: "The whole of the front of the extensive range of buildings was ornamented with a great variety of devices, that admirably displayed many of the varied forms of which gas light was susceptible. This luminous spectacle was as novel as it was astonishing; and Birmingham poured forth its numerous population to gaze at and to admire this wonderful display of the combined efforts of science and art." But Clegg—Murdock's pupil—says, in correction of Matthews, that only two jets of gas were shown, one at each end of the factory. The dwelling he occupied, at the corner of the Villa and Handsworth Roads, in Birmingham, was fitted up with the gas supplied from Soho; and some of the fittings are still to be seen there, in their primitive state.

It has frequently happened, with other discoveries and inventions, that different minds, having no connection with each other, have simultaneously arrived at similar results. Accordingly, what Murdock was doing in England, Lebon was attempting, and with some degree of success, in France. In 1801 the Frenchman introduced gas distilled from wood into his house in Paris; and while Murdock was displaying gas light in front of the Soho Works, in honor of the Peace of Amiens, Lebon, by the same means, and on the same occasion, made the outside of his residence in Paris radiant. The son of Watt, when in Paris in 18 1, accidentally heard of Lebon's conversion of the gaseous product of coal into an illuminating agent; and he wrote to his father, advising that, if anything was to be done with Murdock's patent, it should be done at once. But there was no favorable response; and, to the eternal honor of Murdock, be it known that he gave to mankind the great boon allied with his name, "without money and without price"—never having patented it, never having benefited to the value of one farthing by a commodity which has powerfully contributed to the material comfort of the civilized world, and enriched thousands who, to this hour, have not had the common gratitude to remember in any way their benefactor.

Having, in 1803, supplied the Soho Works throughout with burners, Murdock contracted with an eminent firm of cotton manufacturers—Messrs. Phillips and Lee, of Salford—to fit up their factory. This was done in 1805. He distilled the coal used for the purpose in large retorts. As it rose from these it was conveyed by iron pipes into large reservoirs, where it was washed and purified, previous to being conveyed through mains to the mills. The burners used were of two kinds—one an Argand, the other a small curved tube with a conical end, having three circular apertures 1-30th of an inch in diameter. The economy of the new light was proved by the fact that the consumption of gas, with 271 Argands and 633 other burners, cost £600 a year, against £2,000 for candles.

At about the time Murdock was laying pipes and fitting brackets in the Salford mills, Clegg—his pupil and assistant at Boulton and Watt's—was busily occupied in lighting the cotton mills of Henry Lodge, at Sowerby Bridge. Clegg devised a method of purifying coal gas from sulphuretted hydrogen; and this was first introduced at Stonyhurst, Lancashire. But the disciple never ignored the superior claims of his master as an inventor. Samuel Clegg, Jr., writes: "The progress of the new science, as hitherto related, was chiefly due to the individual efforts of Mr. Murdock and his assistant." Murdock himself, in papers he communicated to the Royal Society (1808), when he was awarded the Rumford gold medal, refers to his achievement in the following modest and sober words: "It is now nearly 16 years since—in the course of experiments I was making at Redruth, in Cornwall, upon the quantities and qualities of the gas produced by distillation from different mineral and vegetable substances—that I was induced, from some observations I had previously made upon the bearing of coal, to try the combustible property of the gases produced from it as well as from peat, wood, and other inflammable substances. Being struck with the great quantity of gas which they afforded, as well as the brilliancy of the light and the facility of its production, I instituted several experiments, with the view of ascertaining the cost at which it might be obtained, compared with that of equal quantities of light yielded by oil and tallow. My apparatus consisted of an iron retort, with tinned-iron and copper tubes, through which the gas was conveyed to a considerable distance; and there, as well as at intermediate points, it was burned through apertures of various forms and dimensions. The experiments were made upon coals of different qualities, which I procured from various parts of the Kingdom for the purpose of ascertaining which would give the most economical results. The gas was washed with water, and other means were employed to purify it."

The manufacture of gas-making apparatus at length became a leading feature at the Soho Works; and the use of the new lighting power was making steady progress elsewhere in England. Pall Mall was lit by it in 1810; and Mr. Ackerman's shop in the Strand was ablaze with gas before any gas company had been established. Architects, when laying pipes for supplying the

legislative chambers at Westminster, gave instructions to the workmen that the pipes should be fixed at a safe distance from the walls; the impression then being that they must grow red hot as the gas was transmitted through them. Murdock's residence at Sycamore Hill, which was built in 1816, had gas supplied to it through pipes connecting with a large gasholder at the Soho Works, until 1834, when the gas company at Birmingham was formed. On the other hand, the old oil light companies, finding that their occupation would soon disappear, naturally looked with aversion upon this formidable rival; and as is usual in such cases, they took high patriotic ground whilst endeavoring to prejudice the public mind against the use of gas. They magnified the danger of explosion; and predicted the decay of our naval supremacy if gas should prevail over oil. Here is a specimen of the plaintive strain in which they indulged: "If gas becomes successful, then our naval supremacy is gone; for at present we obtain artificial light principally from whale fisheries. These are the nurseries of our best sailors; therefore, if we destroy the one the other must be affected. If the fisheries no longer exist, our navy must degenerate." It is almost a similar line of argument to that taken when wheeled vehicles, for the conveyance of passengers from one part of the Kingdom to another, threatened to displace saddle-bags. Pamphlets were written and sermons preached to demonstrate that the decay of morality in England must supervene upon the introduction of such a dangerous innovation. The sexes would, in covered traveling wagons, be thrown together in seductive proximity; and "Ichabod" would soon be written upon our national walls! But even the grotesque objections of the oil light companies are hardly to be wondered at when we call to mind the persistent opposition, for a time, offered to the new light by a scientific authority of the standing of Sir Humphrey Davy; and the incredulity of a great writer like Sir Walter Scott, who at first ridiculed the idea of lighting London with "smoke!"

This account of Murdock would not be complete without some reference to a remarkable individual of the name of Winsor—a man more speculative than scientific—who somewhat unscrupulously attempted to rob our hero of the distinction, which was justly his due, of being the first to perfect, adapt, and introduce gas upon economic and commercial principles. Only the very briefest statement of facts is needed to illustrate the falsity of Winsor's pretensions. This man—a German by birth—happened, when staying in Brunswick, to see a report of Lebon's paper, read before the French Institute, on the gas lighting experiments he had conducted in Paris. In 1802, Winsor arrived in England, and became acquainted with a Mr. M'Kensie, who resided in Green street, near Hyde Park. The latter gentleman allowed Winsor the use of his premises for working out his ideas on gas lighting. But he labored under a disadvantage of being deficient in chemical knowledge and skill; while his attempts were proved to be but an extension of the discoveries of the real inventor. In 1804, he exhibited a plan of illumination at the Lyceum Theatre. It was, however confined to methods of conveying gas from one part of the house to another, by the use of different kinds of burners. In the same year he obtained a patent "for an improved oven for the purpose of extracting inflammable air," which contributed nothing of a practical and lasting value to the progress of gas manufacture. In 1809, he applied to Parliament for a bill to found a wild scheme entitled the National Light and Heat Company, with a capital of £300,000. The extravagant return of 1,000 per cent. in dividends was promised as a bait for investors. Murdock petitioned against the bill, which was finally rejected. He retained Henry Brougham as his Counsel; and as a proof of the primitive notions of our legislators of that day as to the progress of science in this particular department, it is stated that the following colloquy took place between a member of the committee on the bill and Murdock, who was examined before it: "Do you mean to tell us," said the member, "that it will be possible to have a light without a wick?" "Yes, indeed, I do," said Murdock. "Ah, my friend," said the legislator, "you are trying to prove too much." Winsor, who demanded to have the monopoly of supplying gas to the Metropolis, was stopped by Parliament on the ground that Murdock was the rightful claimant to the new discovery. Without the least boasting, he remarked before the Royal Society: "I may, without presuming too much, claim both the first idea of applying, and the first actual application of this gas to economical purposes." Nothing daunted, however, Winsor afterwards applied for a bill to establish the now well-known and prosperous Gas Light and Coke Company, with a capital of £200,000. On this occasion he was successful in obtaining a charter for three years; and this period was permanently extended in 1812. But in 1813 the company was in a very bad way; and was only saved from ruin by entrusting the management to Clegg—the pupil of Murdock.

The proverbial tardiness of the English people in patronizing any novelty, however useful, was strikingly manifested in the early experience of this company. For two years, they fitted up and supplied gas to shops without cost; yet it was some considerable time before gas became a popular institution. The multitude was still so doubtful as to the safety of the invention that, when Westminster Bridge was lighted for the first time, in December, 1813, the men appointed to light the lamps, being startled at the novelty, and fearing the occurrence of some catastrophe, refused to work. Guildhall was illuminated in 1815; and Clegg patented the first gas meter in the same year. But the early pioneers in the field—as has not unfrequently happened with other inventors—spent their talents, time, and labor without reaping any pecuniary advantage. The Imperial Gas Company, subsequently formed, did not at first earn a single shilling of profit; seven years later, however, gas became a favorite source of investment with the public. By 1822 not less than a million sterling was invested in gas lighting; the system being by that date widely diffused over this country, Europe, America, and the colonies.

Murdock lived long enough to witness with pride the universal prevalence of his invention, although without any such lucrative testimonials as were awarded to Rowland, for introducing penny postage, or to Richard Cobden, for breaking down protective tariffs. Yet, in his way, he was as true a public benefactor as either of these. The only public reference of importance to Murdock's decease, which occurred on the 15th of November, 1839, appeared in a Birmingham paper about that date.

Not until forty-four years after this event, when electricity as an illuminant threatens at last, in streets as well as places of public assembly, to supersede gas, is it that some disposition is shown to do suitable honor to his great genius. "Well, better late than never." I venture to assert that, with improvements in gas burners, and in modes of reflecting light from gas lamps, it is more than doubtful if gas can ever be displaced by electricity. The chemistry of the subject has, of late years, been profoundly studied. Methods of purifying gas from elements formerly injurious to picture frames and family health in private dwellings, have proved successful. Moreover, the cost of gas to consumers could still be greatly reduced if the public convenience were the paramount consideration governing the administration of gas companies. In many instances the commercial returns from the ammonia, benzol, coke, and tar—the residual products of gas coal distilled by the companies—cover the entire cost of the coal laid down at the gas works, excluding entirely the profit derived from the sale of gas. Again it has been demonstrated that, by adopting the plan of heating retorts introduced by Sir W. Siemens, twenty years ago, at the Paris Gas works, and recently brought into use in Glasgow, the cost of producing gas can be further reduced. In a lecture delivered before The Gas Institute in 1881, that gentleman spoke of the bright future in store for the gas interest in the following terms: "I should be disposed to regard the electric light as a welcome incentive to fresh exertion, confidently anticipating achievements by the use of gas which would probably have been long postponed under the continued *regime* of a monopoly * * * and although gas will have to yield to the electric light for the illumination of lighthouses, halls, and great thoroughfares, it will be in a position I believe to hold its own as a domestic illuminant * * * and the loss it is likely to sustain in large applications as an illuminant would be more than compensated by its use as a heating agent." Consequently those who are anxious to perpetuate Murdock's memory, by preserving his residence as an International Gas Museum and Library for the working classes of Birmingham, and by erecting to him a statue on the Thames Embankment, do not appeal *in forma pauperis* to the public sympathy, or invite homage to be be paid to the inventor of an expiring industry. On the contrary, when we consider the growing uses to which gas can be applied, the methods by which its illuminating power can be increased, and by which its effect on the atmosphere of dwellings and places of assembly can be rendered approximately innocuous, and the chemical discoveries and mechanical appliances by which the price may still be materially cheapened, we are really dealing with an industry which is taking a new departure, and a fresh lease of vigorous and expansive developement. At the same time our obligations to him who was first instrumental in perfecting the manfacturing of gas, and who presented the fruit of prolonged toil, thought, and expense as a free gift to the world, are proportionately enhanced.

Petroleum as Fuel.

The Engineer says that since the discovery of the oil springs in America, various efforts have from time to time been made to introduce petroleum as a fuel for steam boilers and general heating purposes; but notwithstanding that the subject has been taken in hand by both British and foreign governments, as well as by private individuals of considerable influence and ability, it is a fact that not only has no practical progress been made in the use of liquid fuel, but that in those cases where it has been tried and experiments carried out with the best results as regards evaporative efficiency, the installation has been abandoned, and a return made to our old and much abused friend coal. The reason for this is not far to seek, and consists in the fact that the cost of evaporating a given quantity of water by means of heat produced by the combustion of petroleum so far exceeds that when coal is used, as to much counterbalance any advantages that may be gained; always ex-

cepting those few countries where from scarcity of coal and wood, and abundance of petroleum, the latter fuel is found to be the cheapest.

One of the earliest investigators into the merits of liquid fuel was Sainte-Claire Deville, who carried out a series of very extensive experiments with a couple of locomotives on the Paris and Strasbourg Railway, which were specially fitted up under his direction with appliances for burning the oil. The results of these experiments were published in the *Journal* of the French Academy of Sciences for 1868 and 1869; the average evaporation being given as about 11 pounds of water per pound of fuel. In the United States, commissioners were appointed to specially consider the value of petroleum as fuel on board of steamers, a sum of $5,000 being appropriated for making the necessary tests; but after long and careful trials, the Secretary of the Navy finally reported against its use, on the grounds that convenience, comfort, health, and safety were against it, the only advantage shown being a not very important reduction in bulk and weight of fuel carried. As far as our own country is concerned, the whole subject was brought before the Institution of Civil Engineers in 1878 by Mr. Harrison Aydon, in a comprehensive paper dealing with the matter historically, and in which the results of a great number of experiments made with different forms of boilers under various conditions, and with several kinds of burners, were given. In this paper the use of liquid fuel was strongly advocated, and it was shown that with burners on Mr. Aydon's system, in which superheated steam was used for evaporating the oil previous to combustion, and in which a jet of steam was associated with the burning fuel, perfect combustion without smoke was obtained, with an evaporation almost identical with the full calorific power of the oil. Other burners on somewhat different plans, but all employing the use of steam in combustion, gave almost similar and equally satisfactory results. In view of this it is somewhat surprising to read in a pamphlet recently published in order to puff up the value of "water gas," produced by the process of Dr. C. Holland, to which our attention has been directed, that "how to use petroleum or mineral oil in a direct manner as fuel with good economy and effect has never been discovered." Further, "that if such a direct way to burn petroleum has been discovered, we should have been much later in learning, if at all, how to make the most effective and economical fuel ever known, by using petroleum as a resolvent of water, and thus reproducing the enormous heat which the constituents of water—oxygen and hydrogen—create in reuniting. The effective power of the combustion of oxygen with hydrogen has been shown by the experiments of various standard authorities to be 50 per cent. greater than that of the combustion of the same quantity of oxygen with the equivalent of carbon required for its separation from the hydrogen of the water." This, as is afterward stated, has been learnt and applied by Dr. C. Holland, whose process is thus described: "Not a particle of oil or of oil vapor is burned in this process after its operation is fairly started. The oil is entirely combined with the oxygen of the water—steam—within the retorts, without a single atom of atmospheric oxygen. The constant temperature of the fire chamber keeps the retorts hot enough for the disengagement of the oxygen of the steam in the presence of the carbon of the oil. The chemical affinity of these two elements at such temperature causes them to unite, and so releases the hydrogen of the steam, which issues at the burners in the most powerful combustion, producing, instead of smoke, only the purest aqueous vapor."

These modest statements practically amount to a claim for producing perpetual motion; for it is proposed to acquire heat energy by continually separating water into its constituents, oxygen and hydrogen, and by again combining these two gases, their separation, it is alleged, absorbing less heat than is given out in their combination, so that there is a surplus which may be utilized for raising steam or for any other purpose. The absurdity of such a claim will, of course, be apparent to any engineer who gives the matter a moment's serious consideration; but as there are doubtless many to whom the whole subject is strange, we propose to briefly consider the circumstances attending the combustion of mineral oil, and to make a concise comparison between its calorific power and other properties and those of coal.

A pound of petroleum may be taken as consisting of 0.85 pound of carbon and 0.15 pound of hydrogen, which, if burnt direct to carbonic anhydride and water with the exact equivalent of atmospheric air, would produce 22,700 heat units, with an elevation of temperature of 5,484° Fah., always supposing that combination could take place at this temperature, which is doubtful. This supposes a thermal value of 17,000 units per pound of carbon, and 55,000 units per pound of hydrogen, the former being somewhat higher than is generally allowed for carbon in the solid state, and the latter a little lower than is taken for gaseous hydrogen. Assuming now that instead of being burnt directly with air, the petroleum is first heated in a chamber in contact with steam, to such a degree that partial combustion takes place, the oxygen of the steam combining with the carbon of the oil to form carbonic oxide, while the hydrogen of the steam, as well as of the oil, is set free. In this case the 0.85 pound of carbon will combine with 1.13 pounds of oxygen from 1.27 pounds of steam, giving out 5,950 heat units, and setting free the 0.15 pound of hydrogen in the oil as well as 0.14 pound with which the oxygen was associated in the form of steam. The separation of this steam into its constituent gases is only effected by the expenditure of heat, as much heat being absorbed as is given out in its formation, so that to supply the 1.13 pounds of oxygen, 8,680 units must be communicated from the outside. After this partial combustion there remains 1.98 pounds of carbonic oxide and 0.29 pound of hydrogen, which on issuing from the retorts through suitable nozzles and meeting a proper supply of air would be burnt to carbonic anhydride and water, producing 25,430 heat units. Adding this to the 5,950 units from the formation of carbonic oxide, and deducting the 8,680 units required for the dissociation of the 1.28 pounds of steam, there is left a net total of 22,700 units as the result of the complete combustion of 1 pound of petroleum, which is precisely the same value as was found in the case of direct combustion with air. It will thus be seen that no advantage as regards increase in heating power is obtained by the use of steam. In practice, however, there seems to be an advantage of another kind, inasmuch as the steam is found to promote combustion by bringing about a proper intermixture of combining particles, so preventing the formation of the smoke which nearly always accompanies combustion with air alone, and which is the cause of considerable loss from waste of carbon and reduction in the efficiency of the heating surfaces. Steam also promotes the draught, and so permits of a lower temperature of escaping products than when the draught is entirely dependent on the chimney. Taking this temperature at 300° Fah., and assuming the temperature before combustion at 60° Fah., each pound of petroleum will give 21,460 available units of heat, which is equivalent to an evaporation of 22.21 pounds of water from and at 212° Fah.

Turning now to coal—which we may take as being composed of 83 per cent. of carbon and 5 per cent. of hydrogen, the remainder being chiefly ash, with a little oxygen and nitrogen—and taking thermal values of 14,500 and 50,000 units respectively for 1 pound of solid carbon and hydrogen in the condition in which it exists in coal, we find that the combustion of 1 pound to carbonic anhydride and water will give 14,535 units, while if only the exact proportion of air be admitted, the rise in temperature would be 4,845° Fah. Allowing an initial temperature of 60° Fah., and a temperature of 500° Fah., for the escaping products, this represents an evaporation of 13.5 pounds of water from and at 212° Fah. The evaporative efficiency of 1 pound of coal to 1 pound of petroleum is, therefore, as 1 to 1.64 under the conditions taken; but as with petroleum the admission of air to the combustion chamber can be controlled with much greater exactness than with coal, there is less loss from the cooling effect produced by more air entering than is really necessary to support combustion; and allowing for this, we are disposed to place the possible actual efficiencies as 1 to 2. With this as a basis it is easy to arrive at the relative cost of the two fuels. Taking coal at 15s. a ton, the value of 100 pounds weight will be 8 1-28d. Crude petroleum is at present worth 6d. a gallon, but is not fit to be used as a fuel without distillation. We will, however, take it at 6d., and as the specific gravity is 0.800, water being 1.0, 100 pounds weight will occupy 12½ gallons, and will cost 75 pence. The relative costs of coal and petroleum, weight for weight, are, therefore, as 1 to 9.3; but as we have admitted the evaporation efficiencies to be as 1 to 2, it makes the actual cost of evaporating a given quantity of water with petroleum to be 4.63 times as much as it is with coal.

One of the chief advantages alleged in favor of petroleum is that it would occupy much less space than coal, and that ships could therefore take away a much greater supply of fuel than at present, which would enable them to remain longer at sea, and obviate the necessity for coaling depots. This advantage has been very much overrated, for with petroleum of specific gravity 0.8 equal spaces would be occupied by equal weights of coal and oil. This allows 50 pounds weight to the cubic foot, which is about correct for north country semi-bituminous coal when heaped, Welsh and Scotch being heavier, and therefore making the comparison less favorable to petroleum. It would appear, then, that taking into account the calorific power of the two fuels, a given amount of storage room would be just twice as efficient if petroleum was used in the case of coal. In addition to this there must be reckoned the reduction in the number of stokers, which is no doubt a very important feature, especially at sea. Against this, however, the highly inflammable nature of the oil must always be considered a source of great danger, as well as the difficulty in storing it in vessels sufficiently away from atmospheric action. There is also the difficulty which may arise from the clogging up of the apparatus, and its destruction from the intense heat. The high furnace temperature is also exceedingly apt to produce priming, though this could be guarded against to some extent; but we believe it is entirely owing to excessive priming that such absurd reports have been made as to the evaporative power of petroleum, some experimenters having recorded as much as 35 pounds of water per pound of fuel, whereas we have seen that 22.21 pounds is the maximum amount attainable, even when only the exact supply of air required for combustion is admitted.

That petroleum can under some circumstances become an efficient and economical fuel is a proposition we are not disposed to dispute; for instance,

in Russia, where, from the scarcity of wood and other fuel, mineral oil has been very advantageously used. What we do contend is, that excepting under such special conditions as we are not likely to attain in England and other principal countries in Europe, or even in the United States, which is comparatively close to the oil wells, petroleum is a much more expensive fuel than coal. It is well for us also to state again, that there is no difficulty in burning mineral oils, notwithstanding what may be said to the contrary by anxious inventors. It is too late in the day to claim any very special advantage in the use of superheated steam. This has been done over and over again, and though we do not pretend that one form of burner may not give somewhat better results than another, there is certainly little prospect of any startling discovery being made which is at all likely to enable petroleum to compete commercially with coal as a general fuel for raising steam. What is really wanted is a reduction in the price of oil, but we think that not even the prospective new sources of supply, when made available, will effect much in this direction.

Hartford (Conn.) Does not Want Naphtha Street Lights.

At the meeting of the Board of Alderman of Hartford, Connecticut, held Monday, September 24, the chief topic for consideration was whether the use of naphtha for street lighting purposes should or should not be extended. The argument was called out by the presentation of the following report:

To the Hon. Court of Common Council:

The board of street commissioners invite your consideration of the subject of naphtha gas lamps for street lighting. As you are aware, there have been for some months twenty-five of these lamps in use on Main street.

In our view, they are excellent lamps, furnishing fully as much light as the average coal gas lamp, while the cost is very much less.

There are over 1,400 public lamps in the city, of which only 130 are naphtha. The cost of the 1,280 coal gas lights is $35 per year each. The naphtha lights can be had for $20 a year, burning 336 nights all night.

The expense being but a little beyond half that of coal gas, and the light furnished equally good; we have felt it to be our duty to ask your attention to the subject.

Though authorized by the charter to provide for lighting of the public lamps, we desire the advice of the council before making any radical change in the contracts.

And, in any event, we should not advocate supplanting the coal gas lamps altogether. But 500 or 600 naphtha lamps could be at first employed, it seems to us, to the profit of the city.

If all the lamps were naphtha gas the saving would be $20,000 per annum. We know no reason why a portion of this saving should not be made. No argument is used in opposition excepting this, that it is the duty of the council to buy of the gas light company because it is a home corporation. The gas light company has had a monopoly of street lighting for many years, and a little competition would be healthy, and good for all concerned as consumers. We think this business should be carried on the same as any other, and the city should get its streets lighted properly, and at the lowest price obtainable.

There was a remonstrance numerously signed against the use of naphtha gas, as well as against the electric lights. But it was a mere protest, no reasons being given, and its origin being clearly with those who are interested in the gas light company, the paper did not appear worthy of very serious consideration. Hartford has gone beyond most other places of its size in an extended use of coal gas for street lights. And it would only conform to the economy customary elsewhere if it should curtail somewhat in this respect. The city of Worcester, we are informed, makes use of over 1,000 naphtha lamps, and many other cities use more naphtha than coal gas lamps. Our city has gone to the opposite extreme. We recommend the adoption of the resolution appended. Respectfully submitted by vote of the board,

J. H. Sprague, President.

Resolved, That the board of street commissioners are authorized to make use of such number of naphtha gas lamps for street lighting as they shall deem expedient from time to time, not exceeding one-half the whole number of public lamps.

The reading of the document was listened to with close attention, and when Mayor Bulkeley asked the pleasure of the Board in relation to what action should be taken, Alderman John P. Harbison moved the acceptance of the report and the indefinite postponement of the resolution. Mr. Harbison, in speaking to the question, said, that "at least two members of the street board had told him that they paid no attention to the naphtha lamps, and did not know how they were working. He knew that there were general complaints about the poor quality of light they furnish. There are certain nights in the month when the street lights are not lighted. But if the commissioners see indications of a storm, by giving notice, the street gas lamps are burning within an hour. It is too late, though, to fill the naphtha lamps and get them burning, so the west side of Main street has several times been left in the dark. If this resolution is adopted, who shall decide what streets shall burn gas lamps and what streets naphtha lamps. There is not a city on this continent that has so extensive a line of gas mains in proportion to its business and population, as Hartford. Public lighting is done economically in this city. In many places lamps are kept burning all night in streets where there are no houses, but here it is different. How much more are the street commissioners paying for naphtha light this year than last year, and where did they get their authority for the increased expenditure? The Globe Gas Light Company, of Boston, who have been furnishing the naphtha lamps, don't pay a dollar's worth of taxes into the city treasury, while the Hartford Gas Company turns in $12,000 annually. Relieve the gas company of their taxes and they can furnish gas cheaper than naphtha. It is impossible to keep the naphtha lamps burning if the glass is cracked; there is not pressure enough. And it is impossible to keep the globes clean, for the oil and scum cannot be removed. Worcester used so many of them because the gas company could not afford to lay the mains so as to supply outlying streets. The same is true of New Haven, where 500 naphtha lamps are in use. Where gas is laid they use no naphtha lamps. Had the street commissioners made any report of the way the naphtha lamps had worked in the outlying streets in this city? Members of the board had told him that they did not know anything about it. He had figures to show how many nights the naphtha lamps on Main street had been out and the street commissioners had never made a word of complaint. But if a gas lamp goes out, they are notified the next morning without fail, and that in thirty-three years no citizen, no newspaper, nor the board of street commissioners have ever asked the gas company to lower its price, either publicly or privately. The reduction had always come voluntarily. If the street commissioners will attend more strictly to their legitimate duties, overseeing the work done, and devote less time to theorizing, they will save so much money that the tax-payers will call for their reappointment so long as they live."

Without a word of debate the report was accepted and the resolution indefinitely postponed. The same course was pursued in the lower board.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Suffocated by Gas.—W. P. Winfield, of the firm of Walton, Whisler & Winfield, of Buena Vista, Ind., visited Indianapolis, Ind., on September 27, for the purpose of attending the State fair. He stopped at the Sherman House opposite the Union Depot. After attending the theater, and going about the city with some friends, he returned to the hotel about midnight and was shown to his room. Nothing more was seen or heard of him until about six o'clock the following evening, when the chambermaid informed the hotel people that she had made several unsuccessful attempts to get into Winfield's room, and that she had noticed a strong odor of gas coming from it. The door of the room was broken open, and Winfield's body was found lying on the floor several feet from the bed, and an examination proved that death must have ensued some hours before. Mr. Somerville, engineer and superintendent of the Indianapolis Gas Light and Coke Company, informs us that the gas used at the Sherman House is coal gas, and is supplied from his works. Mr. Somerville says, "It appears that the fixture was defective, and the supposition is that the deceased gentleman turned the gas off and then on again. It was twenty-four hours after he retired before he was discovered, dead. I may add that this is the first case of suffocation by coal gas that has come under my observation in all my experience of twenty years, and the first case that has occured in this city."

Richmond, (Va.) to Send Delegates to the Association Meeting.—The Committee on Light of the Richmond (Va.) City Council, presented the following communication, at the meeting held Tuesday, October 2:

To the Honorable President and Members of the Council:

"Gentlemen: You committee has learned with pleasure that the next annual meeting of the American Gas Light Association will be held in the city of New York during the present month. The object of this Association is the consideration of all questions relating to the construction and management of gas works and the manufacture and distribution of illuminating gas, to the end that its cost may be cheapened and its consumption be increased.

"The members of the Association are men actually engaged in the manufacture of gas, and their discussions are eminently practical. Manufacturers of articles employed in making gas or used in the construction of works bring their latest improvements and most recent discoveries to the atttention of the members of the Association in their annual meetings. It is here that you can most readily gather the results of the experience of the wisest and most successful gas men in the country. All go to learn, and each member is ready to contribute his share to the general stock of knowledge.

"Believing that it would be greatly to the advantage of our city to have some representative of her gas department present at the meeting to be held

this month, we should be glad if your honorable body would take such action as would secure the attendance of such gentlemen as you may desire to represent you on that occasion."

On motion of Mr. Curtis it was ordered that Mr. John M. Higgins, Chairman Committee on Light, and Mr. John H. Knowles, superintendent of gas works, be requested to attend the meeting of the Association. It was also resolved that the sum of $100 be appropriated to defray the expenses of the representatives named in the resolution. The Richmond Council could not have spent $100 in any better way; and the attention of the boards of direction of gas companies throughout the country is called to this action, in order that they may "go and do likewise."

ASPHYXIATED.—Albert Taft, a leading manufacturer and prominent citizen of Burlington, Vermont, was found dead in his bed on the morning of September 30, having been suffocated by illuminating gas which had escaped from imperfect fixtures. Burlington is supplied with water gas.

PHILADELPHIA (PA.) GAS TRUST COKE CONTRACT.—Joseph N. Ruch has entered into a contract with the Philadelphia Gas Trust to take all the coke produced at the Ninth and Fifteenth Ward works, agreeing to pay 7½ cents per bushel therefor. Ruch is bonded in the sum of $50,000 for the faithful performance of the contract. Ruch's proposition to take all the "breeze" was also accepted.

A GAS ASSAY FURNACE.—The United States Assay Office, in Wall street, New York city, has something new in the way of a smelting furnace, which is stated to be the only one of its kind in use in this country. The experiments made have demonstrated the entire success of the apparatus, which is constructed so as to use illuminating gas, mixed with air, for fuel. The gas is let into the combustion chamber in small quantities, at the same time that a blower fans air into the furnace; and, when ignited, the mixture burns with a slow and steady heat. Only forty-five minutes are required to develop the neccessary heat, whereas under the old method from 1¼ to 1½ hours were usually taken up in attaining the desired temperature. The gas heat is a trifle the more expensive.

REDUCTION IN PRICE OF GAS AT PLYMOUTH, MASS.—Austin M. Copp, Treasurer of the Plymouth Gas Light Company, has caused the following notice to be published:

"*To our Consumers and the Public:* Since the present board of directors have had charge of the gas works, it has been their purpose to furnish gas in Plymouth at the lowest possible price that will give a fair return on the capital stock, and we have reduced the price from $5 in 1877, to the present net price of $3.50 per 1,000 cubic feet.

"By a vote of the board the price of gas, from October first, will be $3.50 per 1,000 cubic feet, with a discount of 50 cents per 1,000 cubic feet if paid on or before the 10th day of the month, thus making the net price $3; by these reductions you are making a saving of $2 per 1,000 feet. The gas light company are only able to save themselves from this loss by an increased use of gas on your part, both for lighting, heating and cooking.

"We therefore ask you to join with the gas light company in reducing the price, by obtaining from the company the best burners, globes and fixtures through which to use a liberal quantity of gas; by the use of gas stoves for cooking and heating, which the company will supply at cost; and by using your influence for an increased use of gas for lighting the streets and public buildings.

"This done on your part, and the quality of the gas maintained on our part, we may all look forward to a still lower price in the future.—Plymouth, September 29, 1883."

Mr. Copp writes, under date of October 6, "We have increased our consumption for July, August and September, of this year, by 20 per cent., chiefly owing to the introduction of gas stoves." Place the advantages of such methods squarely before the public, and it will soon be found that the public are not slow to learn and appreciate the benefit to be derived.

CHEAPER GAS FOR GALESBURG, ILLS.—The Galesburg Gas Light and Coke Company has notified its consumers that on and after January 1, 1884, the price of gas supplied will be reduced from $3 to $2.50 per 1,000 cubic feet. Customers who settle their bills at the company's office on or before the tenth of the month will receive a discount of 20 cents per thousand, where 1,000 to 5,000 per month is used, and 30 cents per 1,000 on 5,000 or over (on one or each meter)—or a net price, per 100, 25 cents, per 1,000, $2.30; 5,000, $2 per 1,000 to cash customers.

Secretary J. K. Mitchell, in announcing the reduction—who, by the way, has discovered, a new wrinkle (and, we think, a good one) in the matter of notifications, having caused the same to be printed on a postal card—says:

"The above price is lower than any city in the West with same or double population of Galesburg; and taking light for light, convenience and safety, is the cheapest and best illuminator in the market. Nine out of ten complaints about large gas bills come from poor burners or badly arranged fixtures and globes. Get the best, and with above price all can use gas for light, cooking, etc."

A DEFAULTER SENTENCED.—The Philadelphia Gas Trust's ex-auditor, R. B. Morrell, was sentenced to State Prison for a term of five years, having been convicted on charges of misappropriating gas trust funds.

PUEBLO (COL.) REDUCES THE PRICE OF GAS.—Mr. T. J. Morgan, superintendent of the Union Gas Company, has informed us that at a meeting of the directors of his company, held on August 10, it was decided to reduce the price of gas to all consumers paying on or before the fifth of the month, the rates to be as follows: Up to 5,000 cubic feet, $2.75 per M.; from 5,000 to 15,000 cubic feet, $2.50 per M.; and all over 15,000 cubic feet, $2.25 per M.; the reduction to commence on October 1.

It was also decided to offer the following inducements to parties buying gas stoves. The stove and connections will be sold at actual cost, and half the whole amount will be returned the purchaser in gas free. The rate for gas used for cooking or heating purposes to be $2 per 1,000 cubic feet.

ELECTRIC LIGHTS OUT IN NEW HAVEN, CONN.—The electric lights have not been in use in New Haven for some weeks, having been shut off because the Heat Supply Company stopped furnishing steam power. The Heat Supply Company gave only three days notice of its intention, so that the light company did not have time to supply power for running its machines. An offer to purchase and run the electric light business has been made by Herrick P. Frost, vice-president of the Southern New England Telephone Company, and a special meeting of stockholders is to be held this week to take action in the matter. The *Palladium* says as to the stoppage of the Steam Heat Company: "The Steam Supply Company ceased furnishing steam for power purposes, because the service did not pay. In the long run of pipes there was considerable condensation and leakage, because of the increased pressure. An officer of the company said that the business of supplying steam power in street pipes had never paid in any city. He thought that furnishing steam for heating purposes in New Haven would eventually pay."

And perhaps the electric light will "eventually" pay too; but it seems to be a long and dismal prospective "eventuality."

RICHMOND (VA.) GAS "SEND-OUT."—Table showing the amount of gas made from 1870 to October 1, 1883, giving the increase and decrease for each year, at the Richmond gas works:

Year.	Gas Made. Cubic Feet.	Increase. Cubic Feet.	Decrease. Cubic Feet.
1870.....	60,672,100	5,081,300	
1871.....	67,196,900	6,524,800	
1872.....	74,547,500	7,356,600	
1873.....	84,352,800	9,805,300	
1874.....	82,390,500	.....	1,962,300
1875.....	85,800,700	3,410,200	
1876.....	88,496,700	2,696,000	
1877.....	87,630,200	.....	866,500*
1878.....	88,840,700	1,210,500	
1879.....	89,956,100	1,115,400	
1880.....	97,413,100	7,457,000	
1881.....	112,362,400	14,949,300	
1882.....	123,494,000	11,131,600	
1883.....	69,781,500	5,780,200†	

*Works flooded by freshet.

†Increase for 1883 from 1st February to September 30.

IMPROVEMENTS AT THE CEDAR RAPIDS (IOWA) GAS WORKS.—It became evident last spring to the board of directors of the Cedar Rapids Gas Light Company that the company would have to increase its manufacturing capacity, if the growing demands for "more light" were to be complied with. The president, Mr. A. T. Averill, was accordingly deputed a committee of one to visit the eastern section of the country, with the object of inquiring into the merits of the various patent processes. After a close examination of the same Mr. Averill concluded that coal gas was good enough for him, and recommended that his company take the necessary steps to place them in a position in the future to supply any quantity of gas that might be demanded.

The first step was to secure the needed ground, and the company were fortunate in securing three lots, on First street, between Eighth and Ninth avenues, adjacent to their old works, and occupying the entire block from First street to the river front between Eighth and Ninth avenues. On this plot new works have been erected, at a cost of $25,000, and from now on the company will be in a position to furnish gas in any quantity desired.

The retort house is 36 by 70 feet, built of brick with stone foundations. The building is enclosed with an iron trussed roof, covered with slate, and perfectly fireproof. The house contains six benches of "sixes," only three

benches of which are at present in action. The condenser room is 32 by 84 feet, fitted up with a steam-jet exhauster and condenser, the dimensions of the latter being 4½ by 9 by 12 feet. The purifying room contains four iron purifiers 10 by 12 by 3 feet, and the box lids are equipped with apparatus for removing and easy handling of the same. Connected with the purifier house is a capacious and well-built lime storage house. The holder now in use has a capacity of 28,000 feet, but the company contemplates erecting next year one at least five times as large again. Under the present conditions of working the Cedar Rapids Company can easily produce 100,000 cubic feet per day, and this send-out admits of being doubled when the second set of benches is fired-up. The present daily demand is in the neighborhood of from 60,000 to 70,000 cubic feet. The business of the Cedar Rapids Company has increased about 30 per cent. in the last year, and in that time more than five miles of pipe have been laid. The Cedar Rapids folks have shown remarkable enterprise in the matter of the new works, and much credit should be given to their efficient superintendent, Mr. E. H. Jenkins. Mr. J. was formerly connected with the Indianapolis (Ind.) Gas Light Company; he thoroughly understands his work, and in him the Cedar Rapids Company possesses a thoroughly go-ahead business man.

PHILADELPHIA CITY COUNCILS WANT FREE GAS FOR PUBLIC BUILDINGS, ETC.—The Gas Trust Committee on Finance are considering a resolution recently adopted by the City Councils requesting the Trust to light the city departments free of cost, and also not to make any charge for the maintenance and repairs to gas lamps. Mr. Lane said that the charges for maintenance and repairs would reach $125,510.60, and the amount of gas consumed by the departments and public squares would be rated at $60,000 more, making $185,000 in all. He said that $150,000 had been given to the consumers in reduced gas this year, $180,000 more to employes in increased salaries, and $90,000 to the city in free light, and yet the surplus fund amounted to $800,000, against $737,000 on the 12th of October of last year. He offered a resolution requesting the City Solicitor to state whether the Trust had the authority to maintain and repair gas lamps free of cost. This was adopted.

Mr. Lane then proposed a resolution that the city departments be lighted free of cost after January 1 next. This was opposed by Mr. Alcorn, who thought if there was any reduction to be made it should be in the interest of the consumer, and he was ready to vote to reduce the price of gas from $1.90 to $1.85 per 1,000 feet.

A vote was called upon the resolution to light the city departments free of cost, and it was agreed to postpone action on the matter for the present.

The case seems to us to be about as broad as it is long. If a reduction is to be made in any direction, why not furnish gas at a cheaper rate to private consumers?

THE QUALITY OF BALTIMORE (MD.) GAS.—Prof. Wm. E. A. Aiken, inspector, reports to Mayor Whyte that the gas supply during the past quarter has been uniformly above the standard, and with the exception of a slight trace of ammonia has been very free from all objectionable impurities. Also, that during the quarter, 1,590 samples of oil collected from dealers throughout the city have been tested; 470 flashed at the standard temperature, and 1,120 flashed above the standard.

GAS FITTERS TO THE FRONT.—The gas fitters of Cincinnati, Ohio, organized a beneficial union on September 24, and elected B. J. Cooney President. In this section of the country the reverse of this sort of proceeding holds good. The landlords and tenants are the people who have to organize "unions" to save themselves from the festive gas fitter and plumber.

ELECTRIC LIGHTING TEST FIZZLE.—And now comes the intelligence that another proposed test of the electric lighting apparatus of prominent companies has fizzled out. Our readers will remember that a test was proposed of the apparatus of the companies exhibiting at the Chicago Railway Exposition, which should have the value of the highest expert examination, and upon their award the medals should be given. A jury composed of Prof. Henry Morton, of Stevens Institute of Technology, Hoboken, N. J., Prof. B. F. Thomas, of the University of Missouri, Prof. Charles R. Cross, of the Massachusetts Institute of Technology, Boston, Mr. L. F. Lyne, Editor of the *American Machinist*, and Prof. James Denton of Stevens Institute, was appointed to make such tests.

The companies signing an agreement to enter were the United States, the Thomson-Houston, the Fuller, and the Western Edison. The latter made its signing conditional upon the approval of the parent company, and this approval was not given for the reason, as the Edison Company states, that sufficient tests have already been made. The Brush Company refused to enter at the outset, and the Thomson-Houston Company states that they are too busy to go to the trouble and expense of such a test, and do not wish to spare Prof. Thomson for the purpose. We have not learned the reason of the Fuller Company.

ANOTHER CASE OF GAS SUFFOCATION.—J. E. Spangler, a merchant of Princeton, West Va., arrived in Baltimore, Md., on the night of Friday, October 5. He went to the Niagara House, opposite Camden station, where he registered, and was assigned to a front room on the third story. A servant accompanied him to his room and lighted the gas. The following morning, at about half-past nine o'clock, a waiter rapped upon the door of the room, but received no response. He detected a strong smell of gas, and thinking something was wrong, notified Colonel E. T. Joyce, owner of the hotel. The door was forced open, and the room was found to be completely filled with gas. Upon the bed, lying upon his back, and apparently in a tranquil sleep, was the dead body of Mr. Spangler. The windows were closed, and it was found that the burner-cock was turned full on. There was no evidence presented at the coroner's inquest which tended to show a suicidal intent on the part of the deceased, and a verdict of accidental suffocation by gas was rendered by the jury of investigation. Water gas this time.

TROUBLE CAUSED BY ELECTRIC LIGHT WIRES.—Mr. Gibson, electrician to the fire department of Toronto, Canada, while investigating the causes which led to the repeated ringing of the fire alarm bells of that city, on the night of September 24, discovered that the fire department wires were detached in two places. In both cases the breaks were caused by the electric light company's wires coming in contact with those of the fire alarm system. At Toronto and King streets, where the first break was located, the steel wire was found to be burned through. The cotton covering of the copper wire used by the electric light company had become chafed, and the two wires coming together, a streak of flame shot up into the air and the harder metal collapsed. At Frederick street the same thing occurred. The severed wires were repaired. An interruption to the proper working of a system of fire alarm wires might prove to be a very serious matter.

Put the wires underground.

DECIDED ADVERSELY TO MR. EDISON.—Things do not appear to work well with Mr. Edison since he announced his determination of becoming a "business man" for a year. A decision was rendered October 8, by the Commissioner of Patents, in the interference case of Sawyer and Mann against Mr. Edison, involving the question of priority in the invention of "an incandescent conductor for an electric lamp formed of carbonized paper."

The Commissioner awards the patent to Sawyer and Mann, and in so doing reverses the decision of the Board of Examiners in Chief made July 28, by which priority was awarded to Edison, and affirms the decision of the Examiner of interference in favor of Sawyer and Mann, rendered on June 3. The interference was originally decided in favor of Sawyer and Mann January 2, 1882, but the case was afterward reopened for the admission of new evidence. Upon a second hearing the Examiner of Interference again decided against Edison.

The latter, however, appealed to the Board of Examiners in Chief, and not only set up again the claim to priority, but opposed the issuance of a patent to Sawyer and Mann on the ground that their conductor was not a paper carbon, pure and simple, such as that on which he claimed a patent. On July 28 the Examiners in Chief decided both points in favor of Edison. Commissioner Marble, however, is of opinion that the conductor of which Edison claims to have been the inventor, and the Sawyer and Mann conductor, are substantially the same, and that the testimony shows that Sawyer and Mann had the conductor in a rude form in March, 1878, and in a perfected form in September or October, 1878, while Edison did not have his conductor perfected until October, 1879. This decision only affects Edison's right to a patent for an incandescent conductor made of carbonized paper. He already holds patents for conductors made of carbonized bamboo, willow, and other substances, which, it is said, he uses in nine out of the ten lamps made by him. A decision in his favor would, however, have secured to him the entire control of the manufacture of carbonized conductors, as paper is the only substance of which such conductors are at present made that is not covered by his patents.

A reporter of one of the New York daily papers interviewed Mr. Edison on this subject, with the following result:

"Oh, this is the same old thing over again. I believe if the Commissioner of Patents knew that two and two make four, he would decide that two and two make seven just for the sake of creating a little breeze in the camp. This decision, of course, reverses the decision of the Board of Appeal, which rendered one in my favor, and seems perfectly nonsensical to me. The facts have already been brought out in the case.

"The truth of the matter is that as soon as Sawyer saw how successful I was he became satisfied that there was a bonanza in it, and therefore concluded to claim priority of patent. Commissioner Marble's decision for the time being gives Sawyer and Mann the entire control of the manufacture of carbonized paper conductors. This is the only such conductor now before the public which is not covered by my patents. I shall fight this thing to the end. I shall appeal to the Secretary of the Interior, and if he sustains the Commissioner's decision, I shall seek satisfaction in the courts. The Board of Appeal which decided in my favor is the only tribunal which is well enough acquainted with inventions of this character to give a correct verdict. I have no doubt that should Sawyer be finally successful in the case of this paper conductor he will have the assurance to claim priority of patent on my lamp."

The Market for Gas Securities.

Since our last the city gas share market may be written down as having exhibited unmistakable evidence of strength, all classes of stock being marked up to higher figures, the one possible exception probably being in the case of Municipal. We note an advance of three points in New York gas, which we quote at 129 bid, offered at 132; Metropolitan gas is somewhat stronger, at 188 bid, holders asking 190; Harlem gas still shows a disposition to "go up the scale," latest quotations 111 bid, 113 asked. Mutual gas carries its previous quotation, now selling ex-dividend of 2½ per cent., which dividend was made payable October 10. We quote Municipal gas at 187 to 190. Contral gas is offered at 95. Equitable gas is sluggish at figures same as last given.

Brooklyn gas securities are experiencing a veritable "boom," the market prices for most all of these being higher than those recorded for two or three years back, and this despite the fact that no settlement of the "war of rates" has been definitely reached. The following are the figures: Brooklyn gas at 112 to 116; Citizens, 80 to 82; Fulton Municipal at 98 to 100; Peoples, 62 bid; Metropolitan, 88 to 92; Nassau, 59 bid; Williamsburgh, 89 bid.

Out-of-town shares present no marked features of interest, although this statement may be somewhat modified in reference to the shares of the Washington (D. C.) Gas Light Company. On the strength of rumors that another attempt will be made this winter to place an opposition company in that city, timid holders have shown a disposition to part with their stock at 190. Our advice to such parties would be to hold on to their investments. During the latter part of the week ending October 13, Edison Electric Light stock was bid for at 110, and all classes of electric lighting shares show declining figures in the market reports.

He Blew Out the Gas.—Henry Fisher, a sailor, who went to bed in the hotel at No. 65 Bowery, New York city, at an early hour on the morning of September 29, blew out the gas; but fortunately his precarious situation was discovered before suffocation ensued. The police sent him to the Chambers Street Hospital.

Buffalo (N. Y.) Gas Inspectorship.—There is a controversy going on in Buffalo as to whether Mr. Maycock or Hr. Healy is entitled to hold the position of official gas inspector. This had ought to be a matter admitting of speedy adjustment.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

A Query.

Boston, Oct. 12, 1883.

To the Editor American Gas Light Journal:

I see by the New York newspapers, that Dr. C. F. Chandler, your former Health Officer, has been appointed to examine and report upon the presence of trichina in American pork.

The Chamber of Commerce, of New York, of course, have their opinion on this subject, and, no doubt, are well satisfied that much of the cry about American pork is raised by interested parties; but have they instructed Dr. Chandler, in accordance with their views, so that his report shall coincide with their own on this subject? I ask this question because I remember that, some time since, an explosion occurred on the premises of an extensive oil refinery in Williamsburgh directly across the street from the Williamsburgh Gas Light Company. By the explosion of one of the vessels used by the oil company, the gasholder of the Williamsburgh Gas Light Company was injured—quite a rent being made in one of the sheets, and a large amount of glass was also broken on the premises of the gas company. Happening to be in New York about the time of this explosion on the oil company's premises, and being anxious to see the effects of such an explosion on a gasholder, in company with two other engineers, I visited the premises and carefully examined the holder, and also saw the injury that had been done to the gas company's buildings. I distinctly remembered that a gate, which opened into the brick wall of the gasholder yard, was blown into the yard, and the whole force of the explosion showed plainly the direction from which it came.

Some time after this, being in Williamsburgh, I visited the works of the gas company, and, while there, I was informed that Dr. Chandler had been called upon by the proprietor of the oil company, on whose premises the explosion occurred, and that he had made a report in which he distinctly said that the gasholder of the Williamsburgh Gas Company had exploded, and caused the damage, not only to their premises, but had also injured the apparatus of the oil company on the opposite side of the street. I venture to say that it is doubtful if any report, ever made by any man claiming to have sufficient knowledge of any subject to make his opinion of any weight, was ever received with greater disgust, or its author's opinions were more thoroughly pulled to pieces by the intelligent men of this country, especially those engaged in any business requiring engineering qualities, than this report above spoken of; and I doubt if any man ever lost the respect of his fellows more quickly or thoroughly, after his report was made public. Since that time, I understand that the parties who owned the oil company, when this explosion occurred, have since become the owners of the Williamsburgh Gas Light Company; and I have sometimes wondered whether they would not call on Dr. Chandler to revise his former report, and to show, now that these new owners were more interested in the gas company than in the oil company, and which the lawyers would probably call the "discovery of new and important evidence," to say that, after all, the explosion did occur on the premises of the oil company, and that the said oil company should pay damages to the gas company therefor.

You can see, therefore, why, living here at the "Hub," we feel quite an interest in knowing what instructions the Committee of the Chamber of Commerce may have given Dr. Chandler regarding his report on American pork. Namsag.

Do They Blow it Out?

New York, Oct. 14, 1883.

To the Editor American Gas Light Journal:

Dear Sir: Every few days we see reported in the papers cases of death from the inhalation of illuminating gas. It is also stated that, in a number of these cases, death is caused by blowing the light out. Is this so? And if it is, how is it made known, as the victims are generally past making any explanation, and no one else can be in a position to give proper information on the subject? The most singular part of this matter seems to be that the people who blow out the gas invariably blow out water gas. Why it is that they should all persist in blowing this kind of gas out is one of the things that seems past finding out. It is something not at all likely to be done by any sane person, possessing the least knowledge of the deadly constituents contained in such large proportions in water gas. The fact may be, and I think there can be little doubt of it, that the light itself goes out, caused by the stratification of the gas. And this is very liable to occur wherever this gas is in use. Consequently, it is the person and not the gas that is blown out. Como.

PROPOSALS
FOR AMMONIA WATER.

Sealed Proposals will be received at the Office of the

ST. LOUIS GAS LIGHT CO., 511 Olive Street, St. Louis, Mo.,

On or before the 10th day of November, 1883, for all the

AMMONIA WATER

produced at the works of the Company, for the term of three (3) years, beginning the 1st day January, 1884. The bids must be made by the ton of 2,240 pounds. The quantity of coal carbonized annually is about 42,000 tons. The proposals will be opened on the 10th day of November, 1883. The Company reserves the right to reject any and all bids.

Persons wishing to bid can at any time examine the gas works, and any information can there be obtained in regard to machinery, capacity, etc. A "Standard" Scrubber, of 2,000,000 cubic feet capacity, is now being erected at the works.

GEO. M. PASCHALL, Secretary.

PROPOSALS
For Ammonia Water

Proposals will be received at the office of the

BOSTON GAS LIGHT COMPANY, 24 West St., Boston,

on or before November 15, for all the

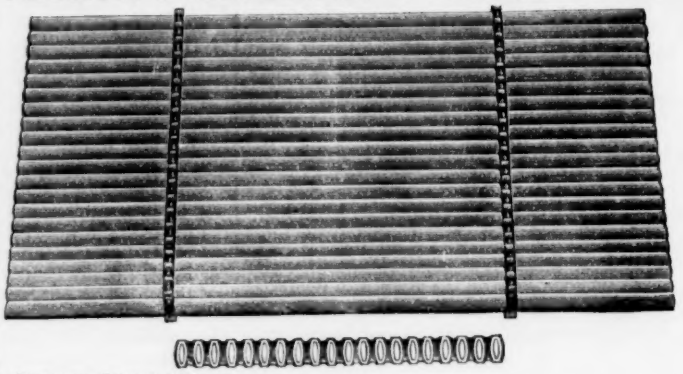
AMMONIA WATER

made at either or both of their stations, based either upon the ton of coal carbonized or the strength of liquor delivered. Contract to take effect January 1, 1884, and to terminate January 1, 1889. Settlements to be made monthly, in cash. The Company reserves the right to reject any and all bids.

W. W. GREENOUGH, Treas.

Boston, Mass., Sept. 27, 1883.

CHURCH'S REVERSIBLE SCREEN FOR GAS PURIFIERS



Very Durable

Easily Repaired.

Oval Slats, with Malleable Iron Cross Bars.

Apply to

JOHN CABOT,

LAWRENCE, MASS.

Patented July 9, 1878.

References in all parts of the country. Send for circular and list of companies who now have the Screen in use.